

## CLAIMS

1. A tunable edge-emitting semiconductor laser (10) including a resonant cavity delimited by two reflectors (15, 20), one of which is a fixed reflector (15) and the other of which is a mobile reflector (20), and including an active section (1) with gain of length  $L_1$  and a tunable section (2) of length  $L_2$ , characterized in that the total length of the cavity  $L = L_1 + L_2$  is less than or equal to  $20 \mu\text{m}$ .
2. A tunable laser according to claim 1, characterized in that the length  $L_1$  of the active section (1) is from  $5 \mu\text{m}$  to  $12 \mu\text{m}$ .
3. A tunable laser according to either claim 1 or claim 2, characterized in that the length  $L_2$  of the tunable section (2) depends on the tuning range of the laser in accordance with the following equation:
- $$\Delta\lambda = \lambda^2/2(n_1L_1+n_2L_2)$$
- where  $\Delta\lambda$  is the tuning range of the laser,  $\lambda$  is the emission wavelength of the laser, and  $n_1, n_2$  are the respective refractive indices of the first and second sections of the laser cavity.
4. A tunable laser according to claim 3, characterized in that it has a continuous tuning range  $\Delta\lambda$  greater than or equal to  $30 \text{ nm}$ .
5. A tunable laser according to any preceding claim, characterized in that the fixed reflector (15) and the mobile reflector (20) each have a reflectivity greater than or equal to  $90\%$ .
6. A tunable laser according to any preceding claim, characterized in that the fixed reflector (15) is an etched mirror.

7. A tunable laser according to claim 6, characterized in that the etched mirror of the fixed reflector (15) is an alternation of semiconductor and air.

5 8. A tunable laser according to claim 6, characterized in that the etched mirror of the fixed reflector (15) is an alternation of polymer and air.

10 9. A tunable laser according to claim 6, characterized in that the etched mirror of the fixed reflector (15) is an alternation of semiconductor and polymer.

15 10. A tunable laser according to any one of claims 6 to 9, characterized in that the fixed reflector (15) is on the front face of the active section (1).

20 11. A tunable laser according to any preceding claim, characterized in that the rear face of the active section (1) is antireflection treated.

25 12. A tunable laser according to any preceding claim, characterized in that the mobile reflector (20) is a mirror external to the laser cavity.

30 13. A tunable laser according to claim 12, characterized in that the mobile reflector (20) is of etched silicon.

35 14. A tunable laser according to claim 12, characterized in that the mobile reflector (20) is of nickel.

15. A tunable laser according to claim 12, characterized in that the mobile reflector (20) is of dielectric deposited on silicon.

16. A tunable laser according to any one of claims 12 to 15, characterized in that the mobile reflector (20) is controlled by a micro-electro-mechanical (MEM)

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24  
controller.

5 17. A tunable laser according to any one of claims 1 to 16, characterized in that the tunable section (2) is an air area.

10 18. A tunable laser according to any one of claims 1 to 16, characterized in that the tunable section (2) is a gas area.

19. A method of fabricating a tunable edge-emitting semiconductor laser according to claims 1 to 18, characterized in that it includes the following steps:

- 15 - producing a laser die (10) including a substrate (8) and an active layer (11) consisting of a gain medium, the length  $L_1$  of the gain medium being from 5  $\mu\text{m}$  to 12  $\mu\text{m}$ ,  
- producing a fixed etched mirror (15) on the front face of the laser die (10),  
20 - mounting the laser die (10) on a base (50), and  
- producing a mobile reflector (20) on the base (50) to the rear of the laser die (10).

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25 20. A method according to claim 19, characterized in that producing the etched mirror (15) includes the following steps:

- etching the active layer of the laser die,  
- depositing a polymer in the etched area, and  
- etching the polymer to constitute a mirror.

30 21. A method according to claim 19, characterized in that producing the etched mirror (15) includes the following steps:

- 35 - etching the active layer of the laser die,  
- further epitaxial growth in the etched area of an undoped semiconductor transparent at the emission wavelength, and

- etching the transparent undoped semiconductor to constitute a mirror.

22. A method according to claim 21, characterized in that  
5 producing the etched mirror (15) further includes a step  
of depositing a polymer in the etched regions of the  
transparent undoped semiconductor.

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